MONOLITHIC REFRACTORY MATERIAL

HIGH-TEMPERATURE REFRACTORY CERAMIC SAVES ENERGY

Benefits

- Saves energy by reducing fuel requirements and heat loss
- Provides one-third the thermal conductivity of conventional material
- Outlasts conventional material by 5 to 8 times with an average return on investment of one year
- Allows processing in the "clean burn" range
- Increases rotary kiln production
- Significantly reduces downtime resulting in 80% faster return to operations
- Increases kiln cross-sectional capacity from 11% to 30%

Applications

This material can be used by any industry using rotary kilns, including the forest products industry, and in varying applications in the steel, aluminum, and glass industries.

Industries worldwide have been searching for a refractory material that can handle higher operating temperatures and maintain wear resistance and thermal shock. Conventional materials have temperature limitations and require frequent replacement from wear and thermal shock. After many years of research, Trilliam Thermo Technologies has developed G-5 – a new wear-resistant refractory material. The new material offers greater dimensional stability, increased wear resistance, improved thermal shock characteristics, and lower thermal conductivity than conventional material–and all at higher operating temperatures (above 4300°F). Instead of conventional refractory bricks, G-5 can be sprayed onto the inside surface of the kiln, reducing downtime for refractory replacement.

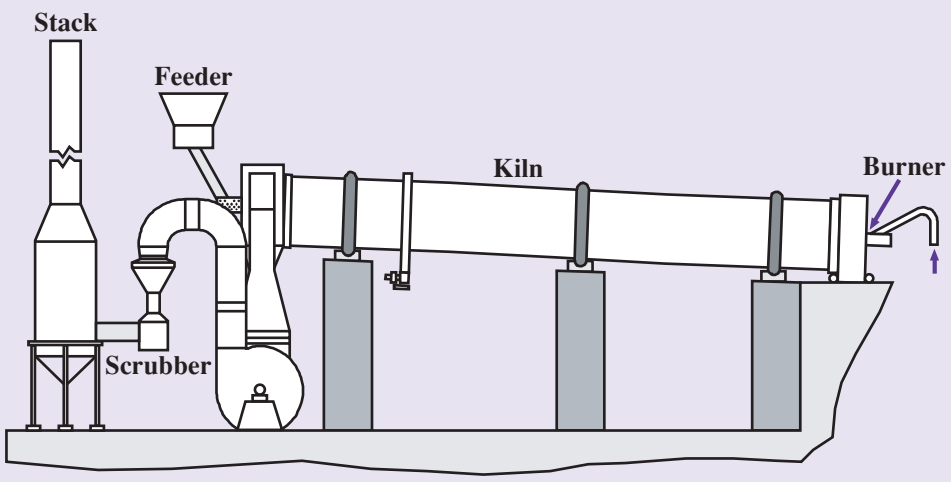
G-5 improves fuel and process efficiencies in three ways:

(1) Reduces stack losses by minimizing the volume of flue gas

(2) Improves the feed-to-product conversion for a given amount of fuel

(3) Reduces heat losses to the environment by lowering the temperature of the environmentally exposed surface of the process containment.

ROTARY KILN



A new refractory material, G-5, can be sprayed directly onto the inside surface of a kiln, reducing the downtime required to replace traditional refractory materials.

Project Description

Goal: The goal of the project is to test and validate Trilliam's G-5 refractory material and commercialize it. After the tests have been completed and validated, commercialization of the material will begin.

G-5 is designed for processing at elevated temperatures, allowing oxygen enrichment of combustion air for higher fuel efficiency and product capacity. Convection and radiant heat losses account for almost one-half of the energy input required to operate a lime kiln. Reducing surface temperature by 470°F using G-5 would result in a 12% energy input savings. Saving 12% of the heat load in all lime kilns in U.S. Kraft pulp mills would reduce their energy needs by 1,500,000 barrels of equivalent oil per year. Assuming the same heat load savings in all U.S. cement plants, 10,560,000 barrels of oil could be saved annually.

Trilliam Thermo Technologies is developing this new material with the help of a grant funded by the Inventions and Innovation Program through the U.S. Department of Energy's Office of Industrial Technologies.

Progress and Milestones

- The new material's final composition has been defined.
- Standard tests on the material have been initiated.
- Patents are pending for G-5.
- Test results have been validated to 4395°F + for over 12 hours.

Economics and Commercial Potential

Application of this technology to rotary kilns results in a reduction of emergency downtimes since G-5 refractory material can be sprayed directly on to the surface and can be cast into place in a variety of shapes, including rings, bricks, pipes, injectors, and cones.

A standard cement kiln has a 14 ft. diameter and an operating temperature of 2500°F. The typical refractory material is 12 in. thick. The skin temperature of the kiln's hot section runs at about 700°F depending on the internal build up. If existing kilns were retrofit with Trilliam's G-5, it would reduce the outside skin temperature to approximately 230°F. A 4 in. thick application of Trilliam's G-5, with an inside temperature of approximately 4500°F, yields an outside temperature of only 424°F. This translates to a 90% retainment in radiant and convective heat for potential energy savings. In addition, a thinner liner (4 inches) adds an 11% to 30% increase in cost capacity, resulting in a reduction of unit cost.

One prototype unit with the G-5 refractory material is undergoing final testing, with four more projects on the drawing board.

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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